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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/075,561	02/13/2002	Bryan Franz Dufner	C-2199Re	3207
7590		10/15/2007		
M P Williams				
210 Main Street				
Manchester, CT 06040				
			EXAMINER	
			ZHENG, LOIS L	
			ART UNIT	PAPER NUMBER
			1793	
			MAIL DATE	DELIVERY MODE
			10/15/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

**Application No.**

10/075,561

**Applicant(s)**

DUFNER ET AL.

**Examiner**

Lois Zheng

**Art Unit**

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 01 October 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-14 and 17-19 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-14 and 17-19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 1 October 2007 has been entered.

### ***Status of Claims***

2. Claims 8, 17 and 19 are amended in view of applicant's amendment filed 1 October 2007. Claims 15-16 and 20-21 are canceled in view of applicant's amendment.

In the supplemental response filed 11 October 2007, claim 23 should be canceled prior to first Office Action. However, there is no claim 23. The new claim 22 was added in applicant's amendment filed 1 October. The examiner interprets that applicant intends to cancel new claim 22. Confirmation of this cancellation is requested to be included in applicant's next response.

Therefore, claims 1-14 and 17-19 are currently under examination.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the

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applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-2, 8-9 and 13-14 are rejected under 35 U.S.C. 102(e) as being anticipated by Taniguchi et al. US 6,083,638(Taniguchi).

Taniguchi teaches a fuel cell comprising a polymer electrolyte membrane(Fig. 2 # 11) having a first major surface in intimate contact with an anode(Fig. 2 # 12) and a second major surface in intimate contact with the cathode(Fig. 2 # 13). Taniguchi further teaches that porous support plates adjacent the anode and the cathode, wherein the porous support plates each comprises a bi-layer including hydrophobic phase means(Fig. 2 # 40C and 41C) for facilitating gas transfer through hydrophobic gas passages(Fig. 2, "F2") and hydrophilic phase means(Fig. 2 # 40D and 41D) for facilitating liquid transfer through hydrophilic liquid passages(Fig. 1, "F1"). The hydrophobic phase means as taught by Taniguchi may be a mixture of carbon black and a hydrophobic polymer such as PTFE (Fig. 11/Table 2, col. 6 lines 46-52) and the hydrophilic phase means as taught by Taniguchi may be a mixture of carbon black and a proton exchange resin such as NAFLON®(col. 5 line 42 – col. 6 line 5, col. 6 lines 46-52). Taniguchi further teaches that the hydrophobic phase means comprises 60% carbon black and 40% hydrophobic polymer(Fig. 11/Table 2) and the amounts of hydrophobic polymer and the amount of hydrophilic polymer are ranged from 5% - 60% and from 3-30% respectively(col. 13 lines 16-19). The hydrophobic and the hydrophilic polymers are loaded onto a porous substrate layer(col. 13 lines 35-41 and 55-61). The fuel cell of Taniguchi further comprises a water transport plate to supply cooling

water(Fig. 1 # 110). The hydrophilic material of Taniguchi allows condensation product water of supersaturated steam to go through to humidify the polymer electrolyte membrane(i.e. wettability preserving compound)(col. 13 lines 27-32).

Therefore, Taniguchi anticipates instant claims 1-2, 8-9 and 13-14.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 3-7 and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Taniguchi et al. US 6,083,638(Taniguchi) in view of Lindstrom US 4,647,359 (Lindstrom).

The teachings of Taniguchi are discussed in paragraphs 4 above. However, Taniguchi does not teach the claimed high structure carbon black as recited in claims 3 and 10.

Lindstrom discloses a gas diffusion electrode comprising a diffusion layer of Vulcan XC-72 mixed with hydrophobic binder such as TEFLON®(col. 2 lines 29-40).

Therefore, it would have been obvious to one of ordinary skill in the art to have incorporated the diffusion layer of Lindstrom into the hydrophobic phase of Taniguchi in order to improve contact with the electrode and enables resistance to flexure of the electrode under the forces of gas or liquid flow in the electrochemical cell as taught by Lindstrom(col. 3 lines 27-36).

Regarding claims 3 and 10, Vulcan XC-72 used with hydrophobic binder as taught by Taniguchi in view of Lindstrom meet the limitation of the claimed mixture of high structure carbon black and hydrophobic polymer with the claimed weight %s.

Regarding claims 4-5 and 11-12, based on the teachings of the amounts of carbon black, hydrophobic material and hydrophilic material in the porous support plates of Taniguchi, the examiner concludes that the amounts of carbon black, hydrophobic material and hydrophilic material as taught by Taniguchi in view of Lindstrom overlap the claimed amounts of carbon black, hydrophobic material and hydrophilic material as recited in the instant claims. Therefore, a prima facie case of obviousness exists. The selection of claimed carbon black, hydrophobic material and hydrophilic material amounts would have been obvious to one of ordinary skill in the art since Taniguchi in view of Lindstrom teach the same utilities in their disclosed carbon black, hydrophobic material and hydrophilic material amount ranges.

Regarding claims 6-7, Taniguchi in view of Lindstrom teach the claimed discrete hydrophobic and hydrophilic regions as claimed. The apparatus as taught by Taniguchi in view of Lindstrom is a fuel cell having a proton exchange membrane as claimed.

7. Claims 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Taniguchi et al. US 6,083,638(Taniguchi) in view of applicant's admitted prior art.

The teachings of Taniguchi are discussed in paragraph 4 above.

Regarding claims 17-18, Taniguchi also teaches the claimed membrane electrode assembly comprising a polymer electrolyte membrane disposed between an anode and a cathode(Fig. 2 #11-13). In addition, the hydrophobic/hydrophilic bilayers

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supported by a porous substrate layer as taught by Taniguchi reads on the claimed at least one support plate. Taniguchi further teaches that the porous substrate layer is impregnated with or sprayed with a hydrophilic resin(col. 7 lines 17-20) and the hydrophilic/hydrophobic material(i.e. bilayer) is applied to both sides of the porous substrate(col. 7 lines 25-26). Therefore, the hydrophilic resin impregnated porous substrate layer as taught by Taniguchi reads on the claimed hydrophilic substrate layer and the hydrophilic/hydrophobic bilayer on the side of the porous substrate in contact with the MEA reads on the claimed partially hydrophobic bilayer. Furthermore, the stack combination of the separator plate providing gas passages(Fig. 1 #20) and the water transport plate(Fig. 1 #110) providing cooling water as taught by Taniguchi reads on the claimed water transport plate.

However, Taniguchi does not explicitly teach that its water transport plate is porous.

Applicant admits that its is widely down to use porous water transport plates adjacent the anode and cathode support layers to facilitate liquid water transport and cooling throughout the fuel cell(col. 3 lines 7-10).

Therefore, it would have been obvious to have use a porous material for the water transport plate of Taniguchi in order to facilitate liquid water transport and cooling through out the fuel cell as admitted by the applicant.

Regarding claim 19, even though Taniguchi does not specifically teach the claimed porosity for the porous hydrophilic substrate layer(NAFLON®), one of ordinary skill in the art would have found the obvious to routinely optimize the porosity of the

hydrophilic material to arrive at the claimed porosity of 65-75% since the porosity of the hydrophilic material directly affects the operation of the fuel cell based on how much liquid are transported across the porous support plates.

***Response to Arguments***

8. Applicant's arguments filed 1 October 2007 and 11 October 2007 have been fully considered but they are not persuasive.

In the remarks, applicant argues that Taniguchi does not teach the claimed increased capacitance and claimed increased capacitance is not inherent since it is achieved by wetting in a mineral acid solution and heating at a controlled electrical potential.

The examiner does not consider applicant's argument persuasive since it is directed to specific process steps of treating the porous support plate and does not provide any structural limitations that differentiate the instantly claimed electrochemical fuel cell apparatus from the fuel cell apparatus of Taniguchi. Since Taniguchi teaches an apparatus that has the same hydrophilic/hydrophobic material containing bilayer as the instantly claimed apparatus, the examiner maintains that the apparatus of Taniguchi is capable of achieving increasing capacitance as claimed.

Applicant additionally argues that Taniguchi does not teach the claimed hydrophilic/hydrophobic bilayer and a separate substrate layer. Applicant further points specific sections of specification providing support for this argument.

However, the examiner does not consider applicant's argument convincing. The supplemental response filed on 11 October 2007 points out that the instant specification



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recites at several sections that the bilayer is transferred or depositing onto a planer surface of the substrate layer and the substrate layer is adjacent to the bilayer.

Taniguchi teaches applying a mixture of hydrophilic and hydrophobic material to both surfaces of the current collector(i.e. porous substrate layer)(col. 7 lines 17-28).

Therefore, the porous substrate layer as taught by Taniguchi is adjacent to the bilayer and Taniguchi teaches the same process of transferring hydrophobic/hydrophilic bilayer onto the porous substrate as described by the instant specification. Therefore, the examiner's interpretation of the substrate is consistent with the instant specification.

Applicant's argument with respect to the porous water transport plate is moot in view of the new grounds of rejection set forth above.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lois Zheng whose telephone number is (571) 272-1248. The examiner can normally be reached on 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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